Chapter 4

Operations and Maintenance of Pedestrian Facilities

1. Pedestrian Facilities in Traffic Work Zones

Construction activities can substantially disrupt sidewalks or other pedestrian walkways. As a result, it is essential that construction plans incorporate appropriate specifications assuring either that the pedestrian passage will be kept open and adequately maintained, or that an appropriate alternative route be established which is both convenient and accessible for all walkway users. In order to assure that adequate facilities for pedestrians have been provided, designers must document the nature of all existing pedestrian activity, including nighttime and week-end activity.

Construction occupying or disrupting the surface of a public sidewalk or path is a particular hazard to pedestrians with vision impairments if the work is not adequately protected by barriers. Persons who use long canes may not detect a tape or a series of widely spaced traffic cones placed around a construction site. Such marking does not provide sufficient warning to enable a visually impaired pedestrian to anticipate a hazard, nor does it provide an edge along which to travel around an obstruction.

Jurisdictions and their contractors should ensure that barriers establishing a temporary passage around public sidewalk and street construction meet the needs of all pedestrians. Scaffolding in the public right-of-way should be carefully designed in order to avoid creating protruding objects along the public sidewalk or pathway.

The removal, even for a short time, of a public sidewalk curb ramp or other accessible element may preclude access to buildings, facilities or areas for persons in wheelchairs or walking with crutches, pushing baby carriages, shopping carts or luggage carriers, or delivering goods on dollies. In some situations the removal of such a curb ramp may not preclude access but may force a lengthy and circuitous route to bypass the resulting barrier. As a result, it is essential that when a curb ramp or other accessible element is removed, an alternate route must be provided which is convenient and accessible for all public sidewalk users, and that route must be clearly marked to avoid extra travel distance.

Table 7 summarizes considerations required for planning, implementing and maintaining pedestrian accommodations at work zones. This table may be copied and, with appropriate notes, included in a project's file as an aid in safely accommodating pedestrians at work sites.

Table 7

Guidelines for Pedestrian Accommodations at Work Zones

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Planning Considerations

1. **Consider origins, destinations and walking paths to determine where pedestrian access should be maintained and where it may be blocked and provided with an alternate path.**

2. **The typical pedestrian will take the shortest route. Therefore, the following planning considerations are important:**

   - **Make it impossible or difficult to walk where pedestrians are not supposed to be. Use barricades, barriers, signals, etc.**

   - **Provide a usable, safe, accessible route with necessary signs, signals, etc., which is as convenient and direct as possible.**

     The key is that the pedestrian must feel that his or her needs have been adequately met. Otherwise, pedestrians will choose their own "safe" route. Pedestrians should feel secure and not be subjected to undue risk. Adequate accommodations must be provided to meet the needs of all types of pedestrians, including school children, blind, elderly, or handicapped persons.

3. **Check for pedestrian generating land-use facilities - schools, senior citizen centers, facilities used by handicapped persons, shopping centers, recreation areas, and restaurants, etc., to determine if additional facilities will be required.**

4. **Consider needs for night time accommodation. In particular, consider the potential masking effect of barricade lights and high visibility work site markings.**

5. **To avoid blockage of the pedestrian pathway by construction material, equipment, and debris, establish a designated location for these items as a part of the construction contract and require in the contract that identified pedestrian routes be kept open.**

6. **Consider stage construction techniques when there is no acceptable alternate routing for pedestrians.**

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Information Needs

1. Advance Information

- Advance information is required only for detours and bypasses.
- Pedestrians need advance information to forewarn them of any sidewalk/path blockages. Information should advise of blockage and give alternate path.
- In general, no advance information is needed for the following situations:
  - Where an accessible pedestrian walkway is provided through the work zones and there is no need for sidewalk blockage or closure and no pedestrian diversion involved.
  - Where the continuity of the accessible pedestrian pathway is maintained and the pathway itself is obvious to all pedestrians.
- Tailor sign messages to specific needs. Typical messages include: Sidewalk Closed Ahead, Sidewalk Closed — Use Other Side, and Pedestrian Detour — Follow Arrow. Signs should be located on barricades detectable to the blind.
- Where groups with special limitations are known to use the facility, public meetings should be held to describe the project, its duration, and its impact on users. In addition, a guide may be posted to alert these users during the initial period following the start of construction.

2. Transition Information

- Provide proper transition and channelization into work zone path - bypass or detour.
- Select channelization devices based on project duration.
- Devices suitable for channelization purposes include: closely spaced cones, temporary marking tape, barricade — Type I or II, ropes or chains, wood railings, portable concrete barriers, etc. Use of tape, rope, chains or railings must take into account the needs and limitations of the visually impaired.

3. Guidance Through Work Zones

- Deadline boundaries of the pathway through the work zone — all pathway situations except detour.
- Select guidance and pathway delineation devices consistent with the duration of the project and the level of hazard.
- Devices suitable for pathway delineation and protection include: closely spaced cones, wooden railings, barricades, and portable concrete type barriers.

4. Exit Information

- No exit information is required if the existing pathway is used, or if the continuity of the accessible pathway is obvious to all pedestrians.
- In case of a bypass or detour, pedestrians need positive direction to return to the original path. Appropriate signing and other devices must be provided for this purpose.

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Pedestrian Pathway Considerations

1. Provide walkway widths consistent with original sidewalk width or sufficient to satisfy current pedestrian volumes.
2. Boundaries of the pathway should be clearly defined for all pedestrians.
3. Walkway surface should be even and free of holes, wide cracks, fixed obstructions, and steep grades. Pedestrian walkway surface should be of stabilized material.
4. Provide nonslip surface for temporary, wood pathways.
5. The transition into and out of redefined or relocated walkways should be clearly defined by markings, signs, or barricades to provide positive direction.
6. A physical barrier may be necessary to keep pedestrians from wandering into a traffic lane or the construction area.
7. Provide ramping where grade differential along the pathway is more than 13 millimeters (half an inch) between existing and temporary designated sidewalk. All ramping should be rigid and firmly secured for safety of wheelchair use, etc.
8. Do not allow changes in construction to block the pedestrian pathway. A periodic inspection and maintenance of the work zone area is desirable.
9. Physical separators between pedestrians and traffic should be selected based on duration of the project and space availability. In all cases, a separator should be used to confine pedestrians to a safe walkway space.
10. The interior of overhead protected (canopy type) pedestrian walkways should be properly illuminated for nighttime visibility.
11. All pathways must be kept clear of projecting items or other obstacles. A minimum vertical clearance of 2.9 meters (114 inches) shall be provided.
12. Evaluate potential impacts of drainage along all identified pedestrian routes and assure that water is effectively removed and that no ponding will occur.
13. If construction will be in place during the winter season, evaluate pedestrian routes to ensure that ice cannot readily form and that adequate space is available for snow removal and storage.

Intersection Crossings

1. If the original crosswalk is altered or removed, provide a clearly defined new crosswalk path using temporary marking tape. Make sure original crosswalk markings are not visible.
2. Keep the crosswalk clear of debris, mud, construction materials, construction equipment, and other devices.
3. Warn motorists if the pedestrian crossing is unexpected. Evaluate any possible need for pedestrian crossing signs, orange color. Special warning signing may be needed if the problem is severe.
4. Provide signing and/or markings to define the entrance to the crosswalk. Channelize pedestrians into the new crosswalk area.
5. Modify traffic signal timing/phasing and location if changed pedestrian needs warrant it.
6. Consider deactivating pedestrian signals or covering signal heads and push-button signs when an existing crossing is not to be used.

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7. **Provide covers, or metal plates, over any cuts or ditches in the area for the entire width of the existing or modified crosswalk.**
8. **Consider lighting the area for nighttime visibility if the cut in pavement is deep or hazardous. This applies to sidewalk cuts as well.**

Sidewalk Closure and Blockage

1. **If existing sidewalk through a work zone is to be closed, two alternatives are possible:**
   - **Detour pedestrian traffic onto the other side where a sidewalk or a pedestrian path is available. Provide adequate signs and barriers for diverting pedestrian traffic onto designated crosswalks. Signs should be placed logically and conspicuously for proper visibility from all approaches. Possible sign messages are: Sidewalk Closed Ahead and Sidewalk Closed, Pedestrians Use Other Side, with an arrow.**
   - **Divert pedestrians onto the planting strip, if there is one, or into the curb lane. When using the curb lane, pedestrians must be protected from moving traffic by adequate physical separation. Possible sign messages are: Sidewalk Closed and Pedestrians Use Temporary Walkway.**
2. **Sidewalk closure should be accomplished with a substantial barrier, Type III barricade. Use signs indicating sidewalk closure and pedestrian diversion.**
3. **If pedestrians have to cross the highway because of sidewalk closure, make sure that an adequate crossing is provided using signing, crosswalk markings, traffic signal modification, and pedestrian signs, if warranted. Curb ramps must be available.**
4. **For short-term utility operations, use less permanent devices, such as Type I or II barricades, or even closely spaced cones. Use signs and cones for delineation and channelization for safe walking around work zones.**

Pedestrian Protection

1. **Separators provided on both traffic and construction sides should be compatible with the level of hazard.**
2. **The type of separator used should not create a hazard itself.**
3. **A physical separator may be needed if the sidewalk on the construction side is to be closed and pedestrian traffic is to be diverted close to moving traffic.**
4. **If there is construction overhead, and the possibility of falling debris or wet concrete, overhead protection should be provided for walkways below.**

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Inspection and Maintenance

1. **Check for compliance with the traffic control plan for pedestrian accommodations.**
2. **Periodically check for missing signs or other traffic control devices installed for pedestrian accommodations in work zones.**
3. **Check for changes in construction activity that would require change in pedestrian accommodations.**
4. **Check for any material in pedestrian pathways, such as spilled concrete, sedimentation, debris, construction materials, and equipment.**
5. **Maintain signal equipment in operational condition. Check bulbs periodically.**
6. **Following rain or snow, check to assure that the pedestrian route is clear and accessible.**

Source: Planning, Design and Maintenance of Pedestrian Facilities, FHWA, 1989.

2. Pedestrian Facility Maintenance

Pedestrian facilities must be properly maintained if they are to be effective and durable. Poorly maintained pedestrian facilities may become serious hazards, pose a liability risk and will impact on a community's image. Maintenance of pedestrian facilities should address the following issues:

- Prompt removal of snow, mud, water or debris
- Periodic refurbishing of the facilities provided

Failure to properly maintain a pedestrian facility will likely compromise the original design objectives of the facility.

a. Sidewalk Repairs

Sidewalks and other pedestrian routes must be adequately maintained to assure that they are accessible to all pedestrians including persons in wheelchairs. Vertical movement and cracking are common problems affecting the accessibility and safety of sidewalks and paths. Vertical movement may result from tree root growth, soil heaving or settlement or loadings in excess of the pavement's design strength. Sidewalks and other routes should be repaired when cracks or vertical shifts exceed limits established by the Accessibility Guidelines for Buildings and Facilities.

A change in vertical elevation of less than 6 millimeters (1/4 inch) does not require any edge treatment. Greater changes in elevation must be corrected. Changes in elevation between 6 and 13 millimeters (1/4 and 1/2 inch) may be corrected using a bevel having a slope no greater than 1:2. For changes greater than 13 millimeters (1/2 inch) either a curb ramp should be provided meeting the requirements established in the federal regulations, or the sidewalk section should be repaired or reset In areas of high pedestrian activity, or in areas where physically impaired pedestrians or pedestrians using carts or carriages are con-

centrated, such as near nursing or rehabilitation homes, in downtowns or near transit terminals, resetting of sidewalk sections or other repairs should be considered in lieu of beveling even if the vertical change is less than 13 millimeters (1/2 inch).

b. Winter Season Maintenance Requirements

Continuity of pedestrian accessibility requires that sidewalks and other pedestrian routes remain open and accessible throughout the winter months. As a result, reasonable effort must be taken to keep pedestrian routes clear of obstruction from snow and free of hazards created by ice.

(1) Sidewalks. Snow storage for streets, highways, driveways or parking lots must not block sidewalks or other accessible pedestrian routes. The setback between a roadway's edge and a sidewalk will often provide sufficient space for snow storage. Where sufficient space is not available, however, snow, ice, snow melt and debris removed from the highway will occupy and block the pedestrian path. Where inadequate storage area is available, highway agencies should schedule and provide for snow removal or clearance as needed to assure that the pedestrian way is kept open.

Similarly, snow banks created by plowing frequently block pedestrian access to crosswalks. All intersections must be hand or machine shovelled to assure that crosswalks, both marked and unmarked, are accessible. To assure compliance with this requirement, highway agencies should maintain an inventory of crosswalk locations requiring clearance following storm events.

Snow melt can create ponds blocking access to sidewalks and especially crosswalks. Intersections and mid-block crosswalks should be designed to assure that drainage can be maintained through snow events. Where adequate design of street drainage has not been provided, plowed snow blocking stormwater inlets must be hand cleared following plowing. Because ponding and icing caused by blocked drainage facilities poses a hazard for both pedestrians and vehicles, effective storm drainage for snow melt must be reestablished as shortly following a storm as possible.

Responsibility for removing snow from sidewalks rests with the adjacent property owner. Municipalities should ensure that they have valid ordinances in place requiring prompt snow removal—usually defined as a requirement that sidewalks are cleared within 24 hours following the end of a storm event. In addition, property owners are responsible for either keeping ice from forming on their property or for applying appropriate traction materials such as sand to protect pedestrians once ice has formed.

Where sidewalks pass through publicly owned properties, for example along parks or adjacent or across highways or railroads, responsibility for snow clearance rests with the agency owning the property unless a jurisdictional agreement has established alternative responsibility.

Effective inspection and enforcement measures are required to ensure that sidewalk clearance responsibilities are met.

(2) Pathways. Paths, trails and linkages located on independent rights-of-way are generally not kept plowed during winter months. Instead, it is generally assumed that these routes during winter will only be used by able bodied persons, properly attired. As a results, these routes generally are trampled down by users rather than cleared.

However, in areas where disabled persons are known to use these paths, or can be expected, jurisdiction should be established to assure that the path is kept as clear as the sur-

rounding system of sidewalks. This requirement is especially important where a pedestrian path forms part of an accessible route required to provide access to a building, facility or site.

c. Inspection and Maintenance Programs

The adequate maintenance and repair of pedestrian facilities can best be assured through the adoption of a periodic inspection and maintenance program. Table 8 presents a sample inspection and maintenance checklist for pedestrian facilities, outlining possible maintenance and repair problems and appropriate activities to correct problems. The frequency with which facilities should be inspected, and maintenance activities conducted, depends upon the environment in which the facility is located and the nature of the maintenance activity.

Table 8
Pedestrian Facility Maintenance Requirements

Pedestrian Facility	Concern	Maintenance Activity
Sidewalks and Walkways	1. Tree roots cracking and heaving the sidewalk.	1. Remove failed sidewalks, cut roots and install new sidewalk. A local arborist should be contacted prior to removing large roots.
	2. Section pop-up of vertical height greater than 13 millimeters (1/2 inch).	2. Replace defective section or provide temporary asphalt shim.
	3. Cracked or spalling surface and poorly placed temporary patches.	3. Replace defective sections.
	4. Snow and ice buildup and ponding from snow melt.	4. Enact and enforce local regulations requiring abutting land users to perform timely clearance activity. Hire private contractor to clear sidewalk and assess cost to abutting land users.
	5. Separation of expansion and construction joints so that space between adjoining sections are greater than 13 millimeters (1/2 inch).	5. Fill joint with hardening expansion compound.
	6. Trash, loose sand, oil and grease on walkways.	6. Serve notice to abutting land owners to clean and maintain sidewalks.
	7. Materials, signs, vending machines, etc. restricting effective sidewalk width.	7. Require responsible parties to remove obstructions.
	8. Low hanging tree limbs, bushes, weeds and other foliage growing into sidewalk and/or posing obstructions and sight restrictions.	8. Enact and enforce local regulations requiring abutting land users to perform timely clearance activity. Hire private contractor to clear sidewalk and assess cost to abutting land users.

Table 8
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Pedestrian Facility	Concern	Maintenance Activity
Crosswalks and Curb Ramps	1. Curb ramp surface is worn into a glazed and slippery surface.	1. Replace curb ramp. Texturize surface with shallow, transverse grooves.
	2. Poor drainage causing water retention in gutter area.	2. Clean gutter and catch basin area.
	3. Street rutting causing water ponding in crosswalk.	3. Resurface street or crosswalk area.
	4. Street repaving resulting in step or transition problem at bottom of curb ramp.	4. Repaving contract specifications should specify a maximum of 6 millimeters (1/4 inch) vertical edge between new pavement and gutter or curb ramp.
	5. Slippery manhole covers in crosswalk.	5. When manholes must be located in crosswalk, they should have slip resistant cover design and be flush with the surface and visible.
	6. Snow and ice buildup and ponding from snow melt.	6. A maintenance program should be developed to ensure snow and ice removal.
	7. Stop bar and crosswalk pavement markings.	7. Identify high volume locations that require additional refurbishing activities.
	8. Separation of expansion and construction joints so that space between adjoining sections are greater than 13 millimeters (1/2 inch).	8. Fill joint with hardening expansion compound.
	9. Pedestrians do not have time to clear roadway prior to signal change.	9. Review pedestrian clearance/ timing plan assuming a maximum speed of 1.1m (3.5 ft.) per second plus a tolerance of 2 seconds for reaction time. Add refuge island in middle of street. Extend sidewalk to edge of parking lane.
Shoulders	1. Debris, trash and loose sand on shoulder.	1. A maintenance program should be developed to provide for regular sweeping of shoulders.
	2. Snow and ice buildup.	2. A maintenance program should be developed to ensure snow and ice removal.
Overpasses and Underpasses	1. Falling objects from overpass.	1. Enclose overpass with chain-link fencing.
	2. Sparse pedestrian use of underpasses.	2. Underpass should be well lighted to provide a feeling of personal security.
	3. Worn step or ramp surfaces.	3. Overlay, replace or texturize to slip free and unbroken surface.
	4. Snow and ice buildup and ponding from snowmelt.	4. A maintenance program should be developed to ensure snow and ice removal.
	5. Section pop-up of vertical height greater than 13 millimeters (1/2 inch).	5. Replace defective section or provide temporary asphalt shim.

Table 8
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Pedestrian Facility	Concern	Maintenance Activity
Work Zones	1. Temporary pathways at work zones are typically constructed of relatively inexpensive, short life materials.	1. The pathway surface should be frequently inspected. Pathway surface materials constructed of wood should be treated with no slip strips or surface treatment. Surface materials with holes, cracks or abrupt changes in elevation should be replaced.
	2. Detour pedestrian paths place greater volumes on detour roadway.	2. The detour pathway should be checked periodically for: • Adequacy of pedestrian and vehicular signal timing. • Proper pedestrian detour signing. • Pedestrian traffic hazards. • Proper motorist information.
	3. Construction materials debris in pathway.	3. Require the contractor to maintain a clear pathway.
	4. Changing pedestrian accommodation needs due to dynamic construction activities.	4. Perform periodic inspection to ensure pedestrian information needs keep pace with construction activities.
	5. Damaged traffic barriers.	5. Damaged traffic barriers should be replaced and their adequacy reevaluated to ensure pedestrian safety.
Traffic Control Devices	1. Signs must be readily visible to pedestrians.	1. Inspect the signs from the vantage point of the pedestrian who is expected to read it. The signs should not be obscured by other signs or foliage.
	2. Pedestrian signs must be at a mounting height that can be read by all pedestrians.	2. If the sign extends into an accessible route they must be mounted in accord with the MUTCD to permit safe passage under the sign. Signs mounted on a wall should be mounted at a height between 1370 millimeters and 1675 millimeters (54 inches and 66 inches).
	3. Pedestrian signals must be maintained.	3. Pedestrian signals should be periodically: • Inspected for damage due to turning vehicles. If damaged, consider back bracketing the pedestrian assembly. • Refurbish, including lens cleaning and bulb replacement.

Source: Planning, Design and Maintenance of Pedestrian Facilities, FHWA, 1989.